

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing

(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2005/050874

International filing date (day/month/year)
01.03.2005

Priority date (day/month/year)
01.03.2004

International Patent Classification (IPC) or both national classification and IPC
C12N15/82, C12N15/55, C12N9/12, A01H5/00

Applicant
CROPDESIGN N.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2005/050874

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☒ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☒ in written format
☒ in computer readable form
 - c. time of filing/furnishing:
☒ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☒ furnished subsequently to this Authority for the purposes of search.
3. ☒ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2005/050874

**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial
applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 1-4,6-20

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the whole application or for said claims Nos. 1-4,6-12,16-20;13-15, and 17, 18 in part
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
 - the written form ☐ has not been furnished
 - ☐ does not comply with the standard
 - the computer readable form ☐ has not been furnished
 - ☐ does not comply with the standard
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☒ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2005/050874

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-12,16,19-21 all completely; 17 and 18 both partially

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	10,11
	No: Claims	1-9,12,16-21
Inventive step (IS)	Yes: Claims	
	No: Claims	1-9,12,16-21
Industrial applicability (IA)	Yes: Claims	1-12,16-21
	No: Claims	

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2005/050874

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/EP2005/050874

1 The following documents are relevant

- D1: US 2003/233670 A1 (CHOMET PAUL S ET AL) 18 December 2003 (2003-12-18)
- D2: YAMAGUCHI MASATOSHI ET AL: "Control of in vitro organogenesis by cyclin-dependent kinase activities in plants." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA, vol. 100, no. 13, 24 June 2003 (2003-06-24), pages 8019-8023, XP002290678 ISSN: 0027-8424
- D3: FABIAN-MARWEDEL TANJA ET AL: "The rice cyclin-dependent kinase-activating kinase R2 regulates S-phase progression" PLANT CELL, vol. 14, no. 1, January 2002 (2002-01), pages 197-210, XP002290681 ISSN: 1040-4651
- D4: WO 03/027299 A (CROPDESIGN NV; DE VEYLDER, LIEVEN; DE PINHO BAROCCO, ROSA, MARIA; MIRO) 3 April 2003 (2003-04-03)
- D5: EP-A-1 033 405 (CERES INC) 6 September 2000 (2000-09-06)
- D6: SHIMOTOHNO AKIE ET AL: "Differential phosphorylation activities of CDK-activating kinases in Arabidopsis thaliana." FEBS LETTERS, vol. 534, no. 1-3, 16 January 2003 (2003-01-16), pages 69-74, XP002290679 ISSN: 0014-5793
- D7: WO 02/081623 A (PIONEER HI-BRED INTERNATIONAL, INC; ARIZONA BOARD OF REGENTS ON BEHALF) 17 October 2002 (2002-10-17)

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

- 2 The application lacks unity of invention for the reasons as mentioned in item IV of this opinion. Additional search fees have not been paid, consequently the subject matter relating to alleged invention 2 as reflected in claims 13-15(completely) and 17 and 18(partially) has not been examined.
- 3 In relation to the subject matter defined in claims 1-4,6-12, and 16-20 the term D-type Cyclin dependent kinase (CDKD) has no well established meaning in the state of the art. The definition used in the description (cf. p.5 l. 32-35) is also insufficient to

unambiguously define the subject matter of the alleged invention. The lack of definition in the construction of the phylogenetic tree particularly as the amino acid is defined as clustering around a D-type CDK whose definition is in itself in question leaves the skilled person unable to determine what subject matter is or is not covered by the claims. The claims have therefore been searched on the basis of the kinase as defined in claims 5 and 21, viz. that defined by SEQ ID NOS:1 and 2. Hence the subject matter of claims 1-4,6-12 and 16-20 (relating to claimed invention 1) which is not limited by this interpretation has not been searched and hence also not been examined.

Re Item IV

Lack of unity of invention

- 4 The application relates in general to cyclin dependent kinase activating kinase and this feature links the claimed subject matter. However this type of kinase has been disclosed in the state of the art, see for example D1 (cf. SEQ ID NOS:389 and 392), D2(cf. whole doc), D3 (cf. whole doc.) and can not therefore be regarded as a special technical feature providing a common contribution over the state of the art within the meaning of Rule 13.2 PCT shared by the whole claimed subject matter.
- 4.1 In the light of D1-D3 the following problems have been identified. The first technical problem is the provision of a method for altering plant yield. The second problem is the provision of constructs suitable for expression of cyclin dependent kinase activating kinase. In identifying the solutions to these problems the ISA has been faced with the fact that the term D-type Cyclin Dependent Kinase has no well established meaning in the state of the art. The term has therefore been redefined on the basis of the sequences with SEQ ID NOS:1 and 2 that characterise such a kinase. The application solves the first problem by introducing into a plant a nucleic acid represented by SEQ ID NOS:1 and 2. The application solves the second problem by the combination of a nucleic acid represented by SEQ ID NOS:1 and 2 in combination with control sequences capable of driving expression and optionally a transcription termination sequence.
- 4.2 No further technical features that may be regarded as special within the meaning of

Rule 13.2 PCT can be found linking these problems or their solutions, hence there is no single inventive concept underlying the alleged inventions within the meaning of Rule 13.1 PCT. Consequently there is a lack of unity and the different claimed inventions not belonging to a common inventive concept have been formulated as different subject matters as follows:

Claimed Invention 1: claims 1-12,16,19-21 all completely; 17 and 18 both partially. Method for increasing plant yield comprising introducing into a plant a nucleic acid encoding CDKD represented by the sequences SEQ ID NO: 1 and 2. Plants produced by the method and transgenic plant having increased yield comprising said isolated nucleic acid.

Claimed Invention 2: claims 13-15 all completely; 17 and 18 both partially. Construct comprising a CDKD encoding nucleic acid as represented by SEQ ID NOS:1 and 2 and one or more control sequences and a termination region. Plant transformed with said construct.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

5 Novelty and Inventive step

- 5.1 The subject matter under examination is that of claimed invention 1 as mentioned in item IV above as limited to the extent that the search was conducted as indicated in item III above.
- 5.2 D1 discloses CDK activating kinase sequences that have been used to improve crop productivity and grain quality (cf. SEQ ID NOS:389 and 392). The sequences have approx. 70% identity with SEQ ID NO: 2 of the application. D2 and D3 both disclose rice equivalents of the sequences with SEQ ID NOS:1 and 2 and their use to increase plant biomass production. Hence the subject matter of claim 1 is not novel within the

meaning Article 33(2) PCT.

5.2.1 The technical features of claims 3-8,12,16-19 and 21 do not combine with that of claim 1 to establish novelty over D1-D3, hence said subject matter also fails to meet the requirement of Article 33(2) PCT.

5.3 D4 (cf. claims 1 and 5) discloses the use of cyclin dependent kinase that may be considered as a functional variant of the sequences of the application to increase seed yield. The subject matter of claim 1 is therefore not novel within the meaning of Article 33(2) PCT.

5.3.1 The technical features of claims 2-9,12,16-21 do not combine with that of claim 1 to establish novelty over D4 hence said subject matter also fails to meet the requirement of Article 33(2) PCT.

5.4 D5 (cf. SEQ ID NOS:13710 and 13711) discloses a nucleic acid that encodes a protein with approx. 70% identity to SEQ ID NO:2 of the application. The same document also claims transgenic plants comprising the sequences (cf. claims 11-18,24-26,29-34). The subject matter of claims 12 and 16-18 is therefore not novel within the meaning of Article 33(2) PCT.

5.5 Even if novelty could be established for some subject matter underlying the application it would nevertheless lack an inventive step for the following reason. D4 (cf. claims 1,5) discloses the use of a cyclin dependent kinase to increase plant (seed) yield through transformation and regeneration of plants with a nucleic acid encoding said kinase. The present application differs in the use of another kinase for the same purpose. The problem is therefore to provide an alternative method for altering plant (seed) yield. The use of cyclin dependent kinase activating kinases of the type embodied by SEQ ID NO:2 of the application is suggested from either D2 or D3 that both disclose the use of the equivalent rice kinases to improve plant growth characteristics. The skilled person would therefore have arrived at the solution provided by the present application in a manner following plainly and logically from the teaching of D4 taken in combination with either D2 or D3. The subject matter of

claims 1-9,12, and 16-21 therefore lacks an inventive step within the meaning of Article 33(3) PCT.

Re Item VII

Certain defects in the international application

- 6 The invention as claimed in the methods of claims 10 and 11, and in claim 12 so far as it relates to this method has not been disclosed in a manner sufficiently clear and complete for the invention to be carried out by the skilled person. Although some of the methods may be considered as routine the specific implementation of these methods to come to a successful solution of the problem, i.e. increasing plant yield, has not been disclosed in the application. This leaves an undue burden on the skilled person to conduct the claimed methods. Hence the requirement of Article 5 PCT is not met.

Re Item VIII

Certain observations on the international application

- 7 The term **D-type Cyclin Dependent Kinase** has no well defined meaning in the state of the art. D7 shows that the term appears to be used in the state of the art for different products. The term **functional variant** used in the claims has no technical meaning as it unclear to which function the term refers. The subject matter of claim 1 is not supported by the description since it extends to methods including plant breeding. However the application only discloses methods that involve transfer to plants that involve transformation and regeneration. These features are not included in the claim hence the claim also lacks essential technical features of the alleged invention. Hence the application does not meet the requirement of Article 5 PCT.

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